"Winter's coming—
quick service concrete
again is our best bet"
LEHIGH
Mills from Coast to Coast
1938 NOVEMBER 1938
1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30

PICTURES IN THIS BOOK SHOW REPEATED USE BY MANY CONTRACTORS OF QUICK SERVICE CONCRETE MADE WITH LEHIGH EARLY STRENGTH CEMENT. IT ALSO MAY BE YOUR BEST BET FOR THE SAME REASONS OTHERS USE IT AGAIN AND AGAIN.

When nights are cool, when cold snaps threaten, when winter comes, Lehigh Early Strength Cement adds safety and economy to the making of concrete. Lehigh Early Strength Cement cures and hardens three to five times faster than normal portland cement used under the same conditions. This speed brings concrete beyond the danger of freezing in minimum time. In severe weather, this speed reduces the time and cost of heat protection about two-thirds. This speed makes possible much earlier form removal. Because of quick re-use, form costs are less. This speed shortens construction time. Greater efficiency, lower labor costs and overhead are natural results. At any season, use Lehigh Early Strength Cement for better, denser concrete of fine surface appearance that may be put into service for most uses in 24 to 48 hours. Use it now—in the fall and winter months—as a safeguard against frost. Use it to offset slow curing and heat-protection costs in cold weather. The Lehigh Service Department will gladly answer any inquiries on the use of Lehigh Early Strength Cement.

REFERENCE TABLES FOR COLD WEATHER CONCRETE ARE PRINTED ON THE BACK COVER

LEHIGH PORTLAND CEMENT COMPANY

ALLENTOWN, PA. CHICAGO, ILL. SPOKANE, WASH.

Makes winter concreting — Safe

VILLA SANCTA SCHOLASTICA, KENWOOD, DULUTH, MINN.

AIRPLANE VIEW, VILLA SANCTA SCHOLASTICA

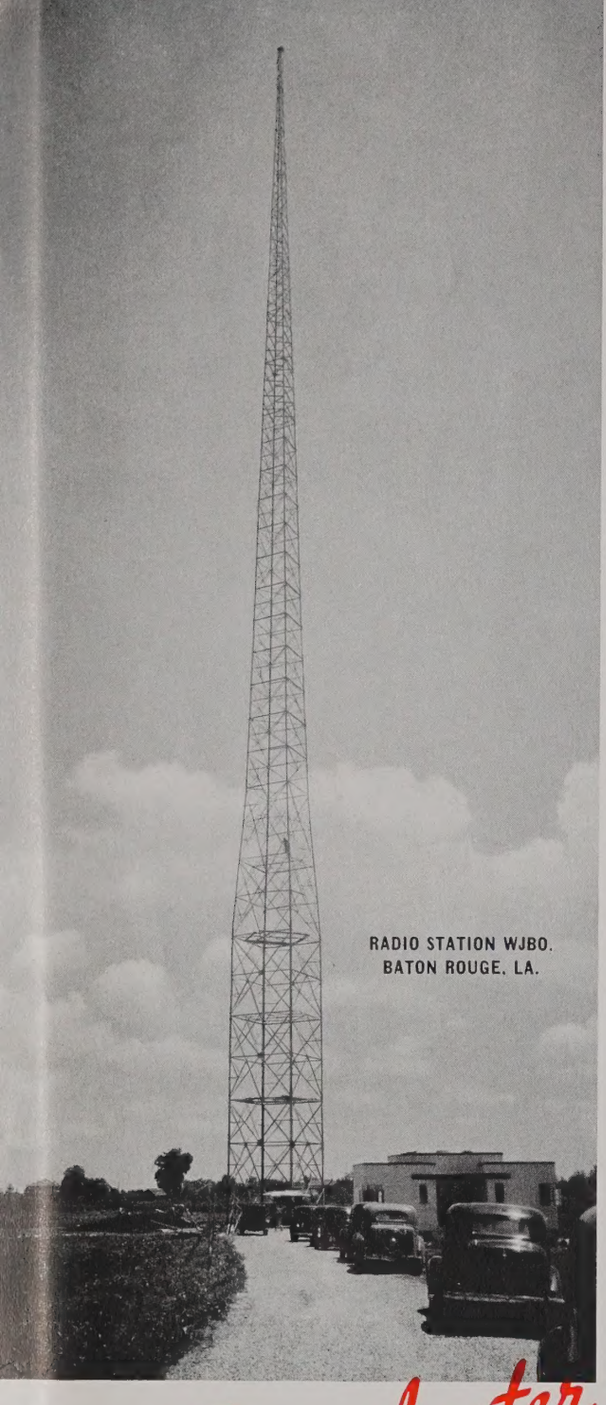
SCHEDULE UNINTERRUPTED DESPITE ZERO WEATHER

As the airplane picture shows, Villa Scholastica is high on a bluff over Lake Superior. McGough Bros., St. Paul, Minn., Contractors, had a tough problem to continue concreting in the face of high winds and sub-zero temperatures. Heat curing was difficult and the fire hazard was great. Yet the job could not be delayed. As a safeguard, the contractor used Lehigh Early Strength Cement to reduce curing time to a minimum. The period of heat protection was cut from 6 days to 2 days. Because of ability to strip forms quickly, only two sets were required. Because brickwork around concrete framework could proceed sooner, construction time for chapel tower was reduced 8 days. $300 was saved on cost of form erection in addition to the time saving, two-thirds reduction in curing cost, and one-third saving on forms. The construction was uninterrupted all winter.

HOLY SPIRIT SCHOOL, ST. PAUL, MINN.

Again

After this time and cost saving experience, McGough Bros. again used Lehigh Early Strength Cement for economy on the Holy Spirit School. In addition to quicker completion of the entire job, the ability to strip forms quickly saved $500 on form lumber. Time saving reduced overhead costs by $500—a total saving of $1000.



RADIO STATION WJBO.
BATON ROUGE, LA.

3 to 5 times faster

STATE-TIMES MORNING ADVOCATE BLDG.,
BATON ROUGE, LA.

TIME SAVING MEANT MONEY SAVING

The primary reason why L. W. Eaton, General Contractor of Baton Rouge, La., used Lehigh Early Strength Cement for the Times Advocate Building was speed. Besides quick completion, he found that because of quick removal and re-use, forms cost 50% less. His overhead costs were also lower.

After this satisfactory experience, Mr. Eaton again used Lehigh Early Strength Cement for the concrete base of antennae tower of Radio Station WJBO. Steel erection was started 48 hours after the concrete was placed and quick completion enabled Station WJBO to cash in earlier on profitable broadcasting of the NBC Blue Network.

Again

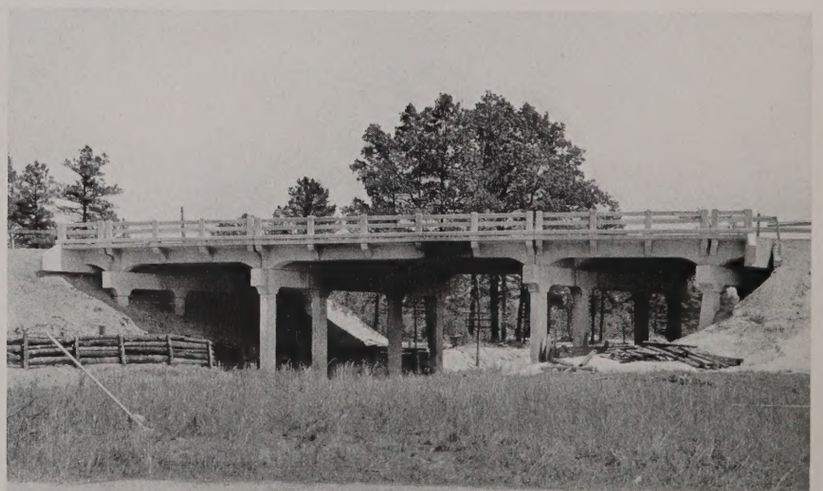
REDUCED CONSTRUCTION TIME 56 DAYS—SAVED $200

W. D. Dean, Richmond, Va., Contractor, used Lehigh Early Strength Cement for the bridge near Cobham because he could strip forms and put concrete into service after 3 days. Savings on form lumber amounted to $200 and construction time was shorter by 56 days.

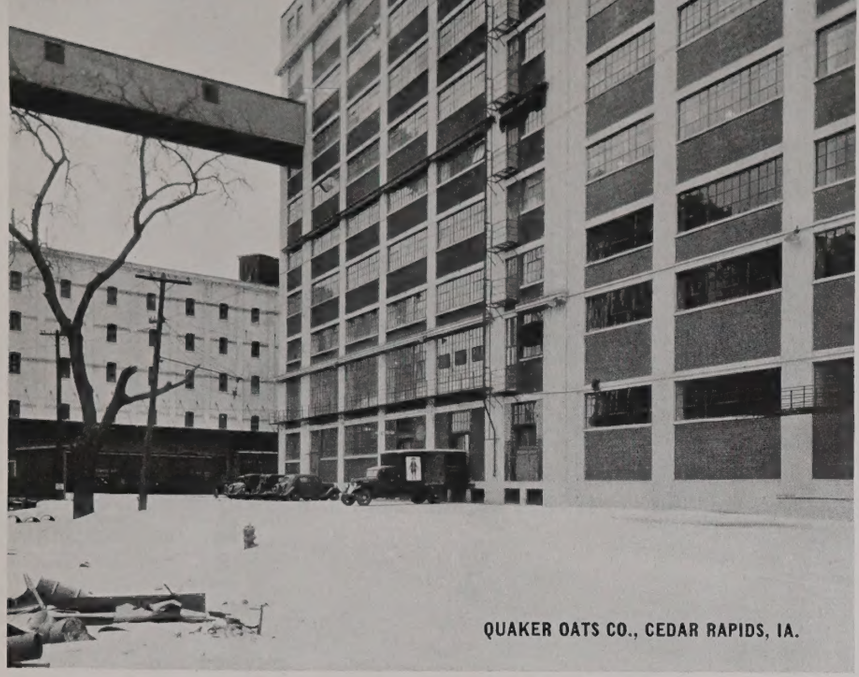
For the bridge widening job at Doswell it was obligatory that traffic be maintained during construction. Again, Mr. Dean took advantage of the quick curing of Lehigh Early Strength Cement to provide quick use of new portions of the concrete. In addition to his ability to keep traffic moving, Mr. Dean completed the job and released labor and equipment 25 days sooner than would have been permitted by the State Highway Dept. with normal portland cement.

Again

VIRGINIA STATE HIGHWAY BRIDGE. NEAR COBHAM, VA.



VIRGINIA STATE HIGHWAY BRIDGE, DOSWELL, VA.



QUAKER OATS CO., CEDAR RAPIDS, IA.

LINCOLN HIGHWAY, NEAR CEDAR RAPIDS, IA.

NATIONAL OATS CO.,
CEDAR RAPIDS, IA.

NATIONAL OATS CO.

FROST PROTECTION AND QUICK USE

When Haegg Construction Co., Cedar Rapids, Ia., installed new concrete coping 100 ft. above the ground on old National Oats Co. elevator, heat protection was impossible. The temperature was 40° and Lehigh Early Strength Cement was used to obtain concrete that would quickly harden beyond the danger of freezing. For the same reason it was used for new concrete steps and entrance.

By these experiences, the contractor knew Lehigh Early Strength Cement would prevent long shut down to shipping when building a new Quaker Oats Company driveway. Concrete was placed at 25°, covered with straw and opened to truck traffic after only 3 days.

Again, Haegg Construction Co. needed quick service concrete. Public convenience demanded minimum interruption to traffic when rebuilding a section of the Lincoln Highway. Only 48 hours after pouring, road was open to traffic.

MINIMUM TRAFFIC DELAY

When widening highway at Allentown, Pa., Contractor Walter M. Mumma, Harrisburg, Pa., used Lehigh Early Strength Cement. The quick service concrete permitted opening the new concrete to traffic in a third the usual time. For paving Carlisle's busiest street, one side at a time, Mr. Mumma *again* used Lehigh Early Strength Cement because he could satisfy public convenience and prevent business interruption with concrete that could be opened to traffic in 48 hours.

Again

MARKET STREET, CARLISLE, PA.

U. S. HIGHWAY NO. 222, ALLENTOWN, PA.

—permits continuous construction

WOLCOTT BUILDING. HUTCHINSON. KANSAS

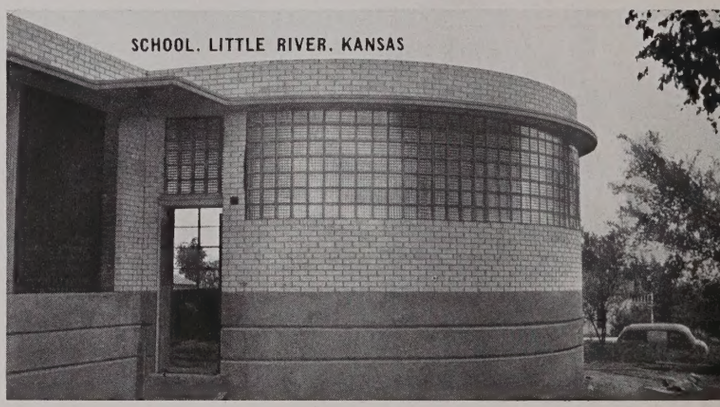
Minimum heat curing costs

WOLCOTT BUILDING

BEATS COLD WEATHER—SAVES TIME AND MONEY AT ANY SEASON

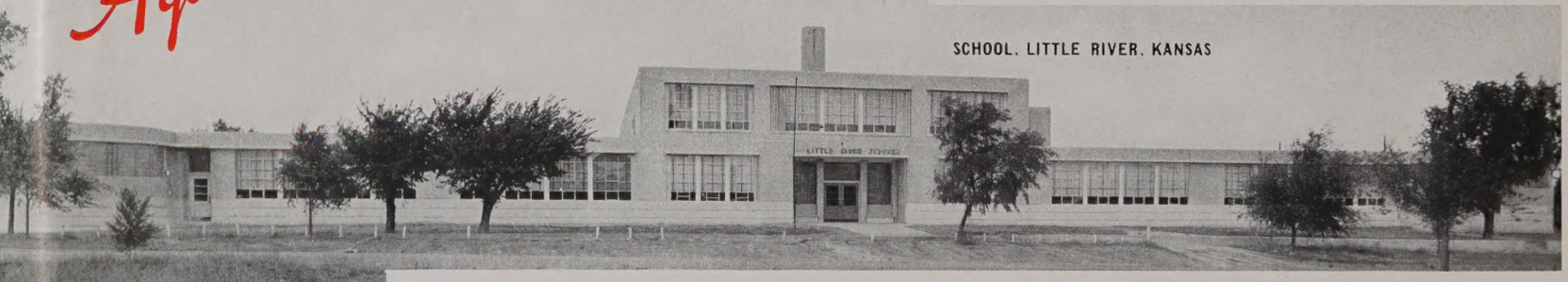
M. C. Foy & Son, Hutchinson, Kansas, Contractors, used Lehigh Early Strength Cement in office building construction as a winter safeguard and to hasten completion. Forms were stripped 5 days sooner than would have been the case with normal cement. The heat-protection period was minimum. Because of quick re-use, form requirements were reduced from 4 sets to 2 sets for column heads and from 4 sets to 3 sets for floors. Including savings on heat costs and overhead, the contractor estimated quick service concrete reduced construction cost by $1500. Shortened construction time meant earlier financial return for the owner, since the building was 80% rented before completion.

Since the time and money saving advantages resulting from quick service concrete apply at any season, under any job conditions, M. C. Foy & Son again used Lehigh Early Strength Cement for High and Grade School building at Little River, Kansas, and for Junior College Building at Hutchinson, Kansas.



SCHOOL. LITTLE RIVER. KANSAS

Again



SCHOOL. LITTLE RIVER. KANSAS

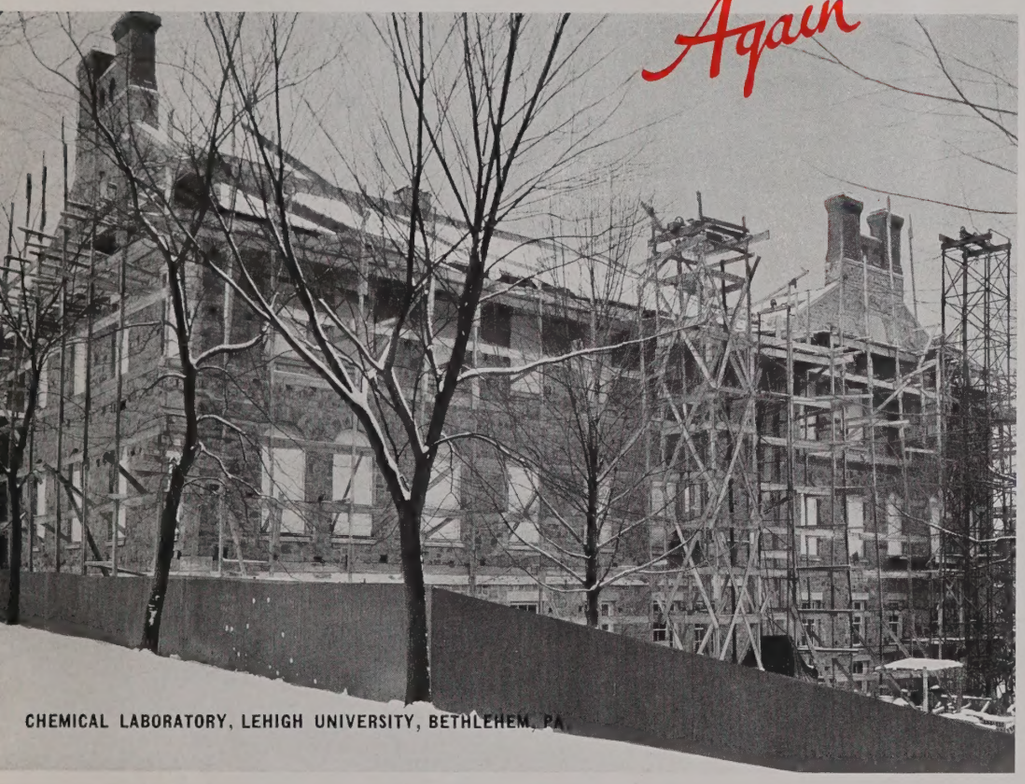
Again

JUNIOR COLLEGE BLDG.. HUTCHINSON, KANSAS

Abates barrier nuisance

TROLLEY LOADING ISLAND. ALLENTOWN. PA.

Again



CHEMICAL LABORATORY, LEHIGH UNIVERSITY, BETHLEHEM, PA.

PUBLIC CONVENIENCE—HEAT CURING AVOIDED—COLLEGE DORMITORY COMPLETED ON TIME

Hoch Contracting Co., Allentown, Pa., found how public convenience was served by using Lehigh Early Strength Cement for trolley loading platform. Street traffic was blocked only four hours. Only twelve hours after starting to pour concrete the platform was put into full service.

Later, when building floors for Lehigh University's Chemical Laboratory, Mr. Hoch completed the concreting for the first floor with Lehigh Normal Cement. With the approval of the engineer he completed the job with Lehigh Early Strength Cement. Results proved the wisdom of the change. Compared with the use of normal portland cement, forms were removed in one-quarter the time. Form costs were 50% less. Saved heat-protection costs entirely—salamanders were available but not used because concrete for each floor quickly cured beyond freezing danger. The entire operation was expedited—quick use of rough floors permitted continuous construction.

After these time and money saving experiences Mr. Hoch again used Lehigh Early Strength Cement for the floors of the Lehigh University Dormitory. In this case speedy completion was vital—occupancy was required at opening of college. Without quick service concrete on-time completion could have been accomplished only at heavier expense and with many more forms.

DORMITORY, LEHIGH UNIVERSITY, BETHLEHEM, PA.

Again

Safe from frost in a few hours

BRIDGE. HADLEY. MASS.

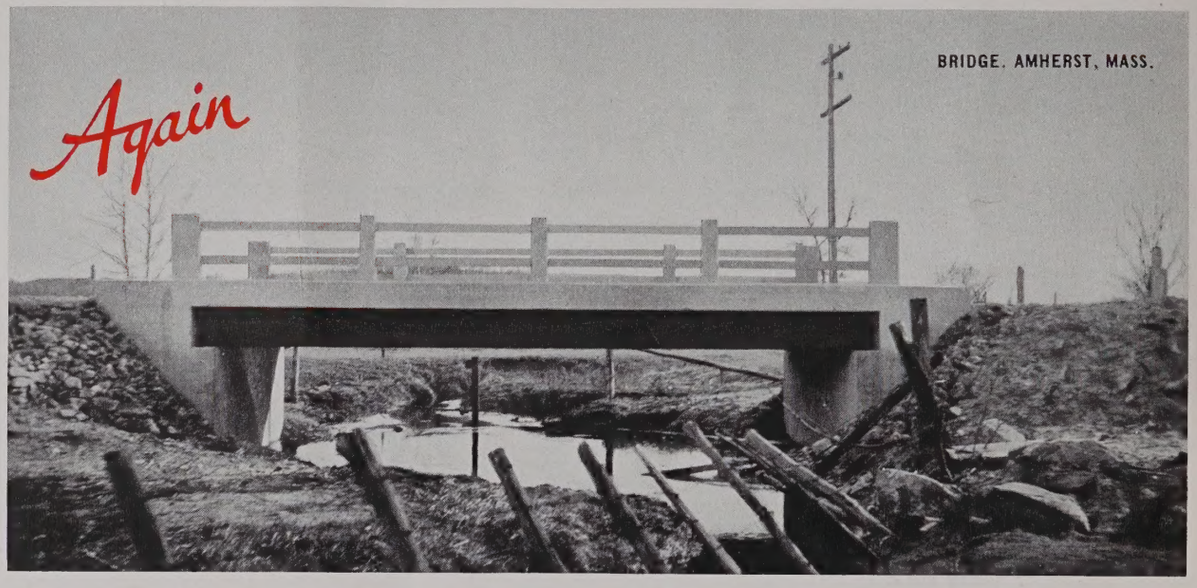
Service strength in 24 to 48 hours

40 DAYS INSTEAD OF 120

Highway bridge construction is always a public inconvenience. To serve the public by curtailing a costly and troublesome detour, Charles I. Hosmer, Inc., Greenfield, Mass., Contractor, used Lehigh Early Strength Cement for Fort River Bridge at Hadley. With normal cement, construction time would have been 80 days longer. Only 48 hours after the final pour traffic was permitted over the new bridge—a 50-ton shovel was among the first vehicles to cross. Such a satisfactory experience naturally decided Mr. Hosmer to again use Lehigh Early Strength Cement when speed was a requisite for the erection of the bridge at Amherst, Mass.

Again

BRIDGE. AMHERST, MASS.



FOR ECONOMY, FOR SPEED AND AS A COLD WEATHER SAFEGUARD

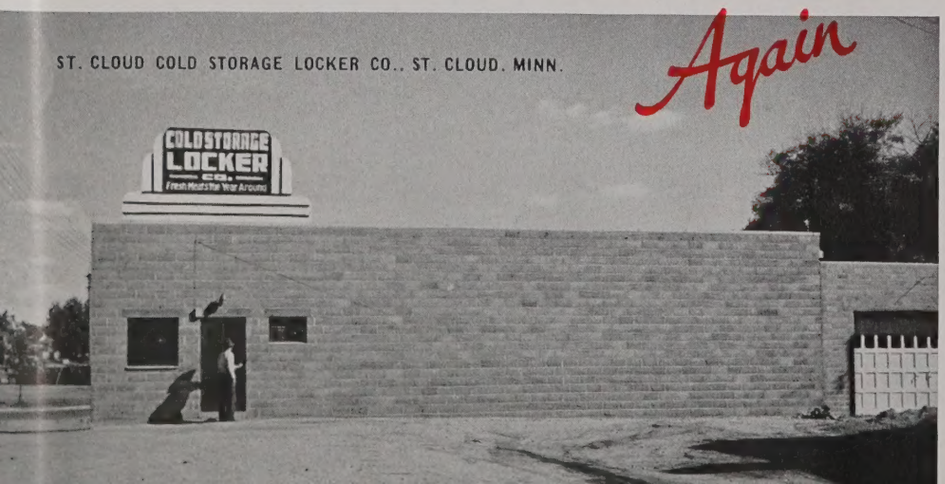
Again and again, L. A. Borgert, St. Cloud, Minn., uses Lehigh Early Strength Cement. For the two service stations, quick service concrete permitted quick economical completion and use. For the cold storage building three weeks were saved in construction, $35.00 was saved in heat-curing costs. In 20° to 25° temperatures it was possible quickly to remove and re-use forms. Mr. Borgert wrote as follows:

"I have used your Early Strength Cement since you put it on the market, and I think it's the best. I use it in my Concrete Products plant and find that it makes it possible to get along with less equipment. It's just the cement to use in cold weather as it lessens the chances of freezing and need not be protected nearly as long. And it's tops for floors, steps, castings, such as concrete joists, slabs, etc."

SINCLAIR OIL COMPANY. ST. CLOUD, MINN.

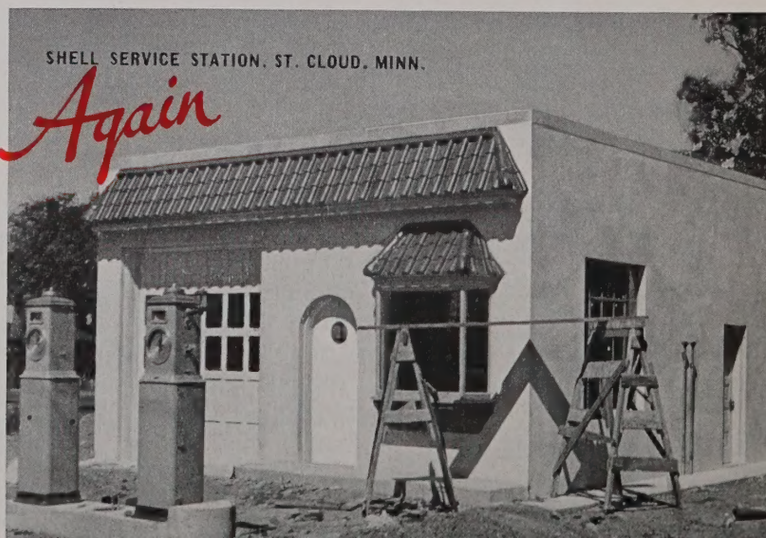
ST. CLOUD COLD STORAGE LOCKER CO., ST. CLOUD, MINN.

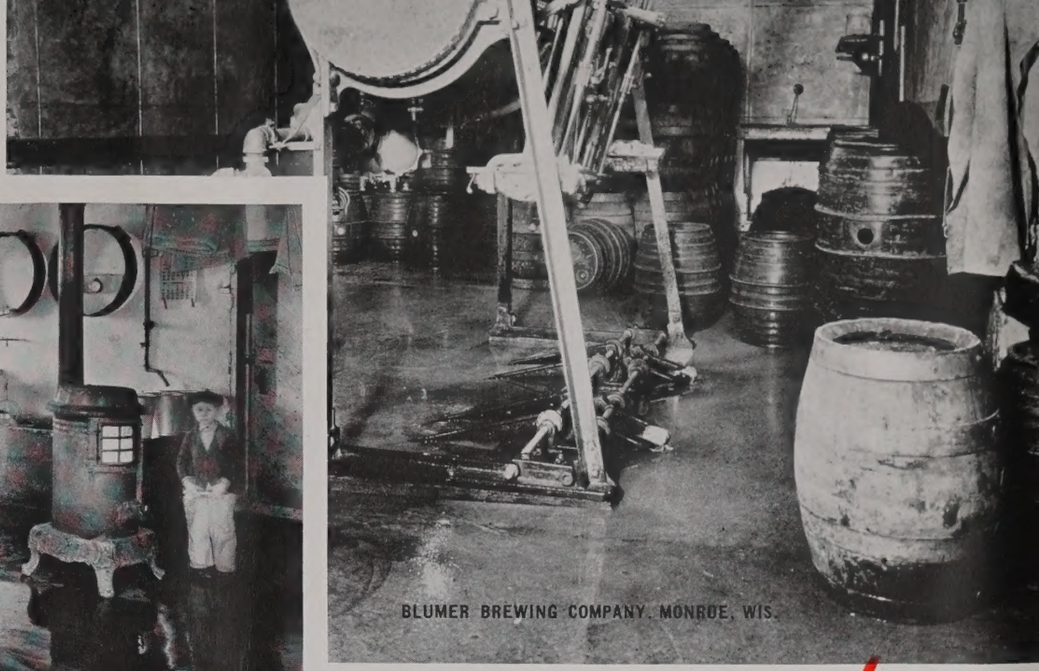
Again



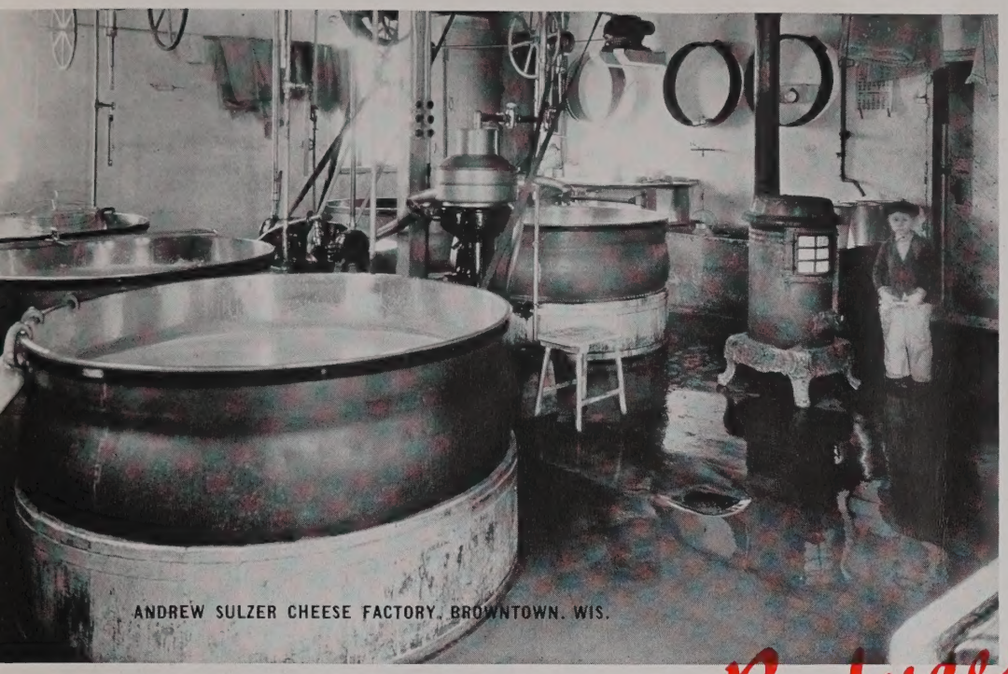
SHELL SERVICE STATION. ST. CLOUD. MINN.

Again





BLUMER BREWING COMPANY, MONROE, WIS.



ANDREW SULZER CHEESE FACTORY, BROWNTOWN, WIS.

Reduces overhead costs

SHUT-DOWN AVOIDED

Max H. Voelkli, Monroe, Wis., contractor, used Lehigh Early Strength Cement for new brewery floor. At noon one day the old floor was torn up and the new one poured. At noon the next day the new floor started to take the gaff of heavy service.

Again, Contractor Voelkli prevented a factory shut-down when he replaced cheese factory floor with quick service concrete made with Lehigh Early Strength Cement. New floor was started at noon and put into service the next morning.

SIDEWALK, LYCOMING HOTEL, WILLIAMSPORT, PA.

Again

SIDEWALK, WILLOW ST., WILLIAMSPORT, PA.

Again

MERCHANTS' PROFITS AND PUBLIC CONVENIENCE

In Williamsport, Pa., Contractor Ray F. Thomas knows that downtown sidewalk barricades for long periods drive business away from stores and are a nuisance to the public. He also recognizes that quick construction permits more work with the same labor and equipment. These are reasons why Mr. Thomas repeatedly uses Lehigh Early Strength Cement for sidewalks in busy locations. In from 7 to 24 hours Mr. Thomas permits full use of the new walks. He finds that Lehigh Early Strength Cement makes the finest quality concrete of maximum density and good surface appearance.

SIDEWALK, MARKET SQUARE, WILLIAMSPORT, PA.

PEARL STREET, BUFFALO, N. Y.

Avoids long detours

HAMBLETON TERMINAL CORPORATION, BUFFALO, N. Y.

MINIMUM HINDRANCE TO BUSINESS

When Rock Asphalt & Construction Co. of Buffalo, N. Y., used Lehigh Early Strength Cement for base course of busy street, traffic was permitted after 36 hours.

Again

Again, this same contractor speeded up a job to shorten the period when gasoline service station was idle. Traffic was permitted on new pavement sections in 24, 48 and 72 hours.

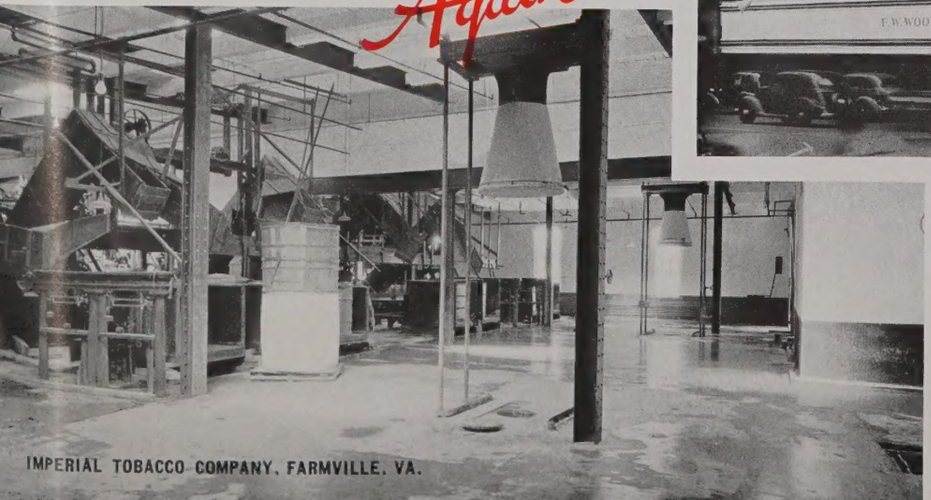
Makes better denser concrete

QUICK FLOOR CONSTRUCTION AVOIDS LONG HOLDUP OF PLANT OPERATION—IN NEW BUILDING EXPEDITES ENTIRE JOB

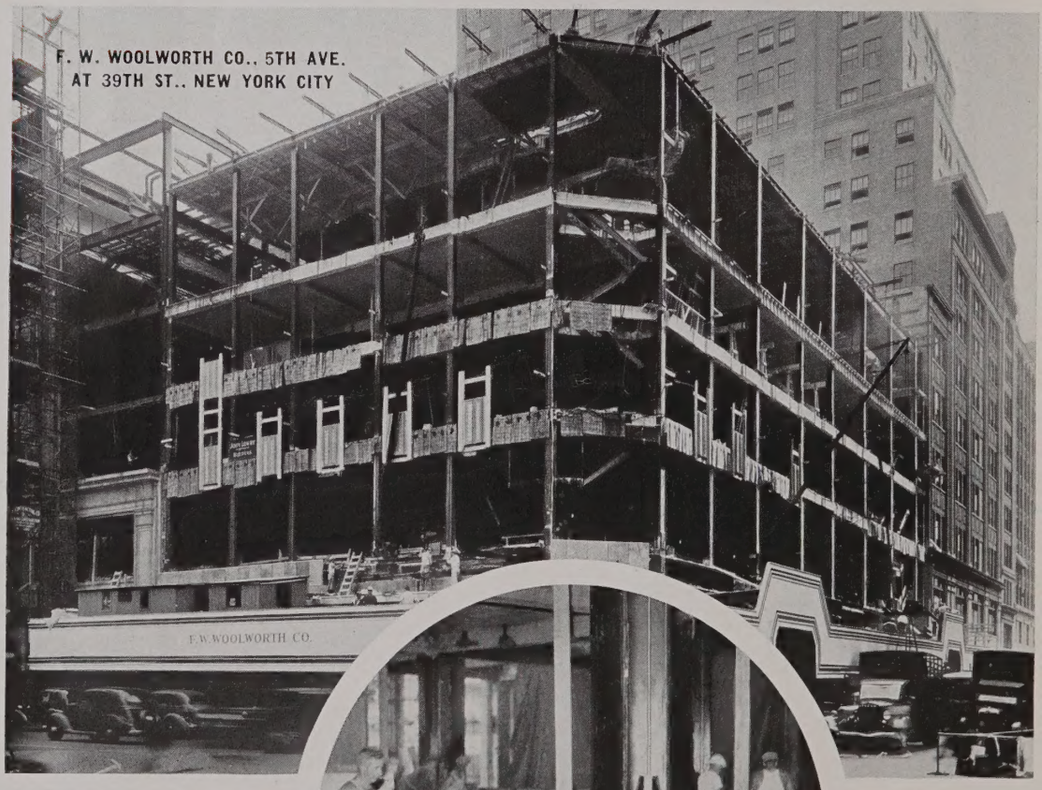
Heavy duty floors in tobacco factory were needed badly. This required the densest possible concrete in the shortest time. Brennan & Sloan, Inc., New York contractors, used Lehigh Early Strength Cement and permitted heavy trucking on new floors in a fraction of the time which would have been possible with normal portland cement.

Again, Brennan & Sloan used Lehigh Early Strength Cement for quick floor construction in the Woolworth Building. In minimum time 24 ft. floor forms were removed and other contractors moved in to hasten the entire building to early completion.

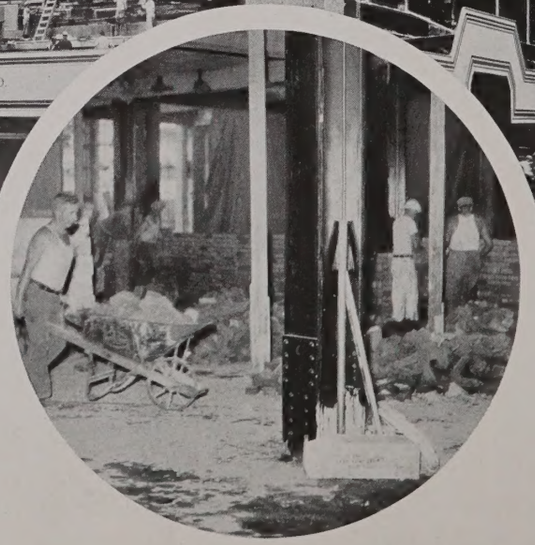
Again



IMPERIAL TOBACCO COMPANY, FARMVILLE, VA.



F. W. WOOLWORTH CO., 5TH AVE. AT 39TH ST., NEW YORK CITY



MINNEAPOLIS-HONEYWELL REGULATOR CO., MINNEAPOLIS, MINN.

MINNEAPOLIS-HONEYWELL REGULATOR CO., MINNEAPOLIS, MINN.

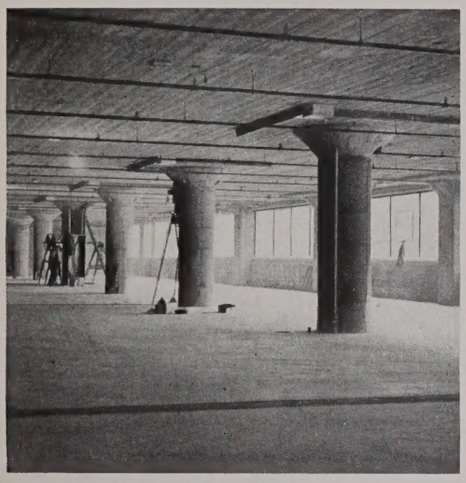
QUICK COMPLETION CAUSED QUICKER MANUFACTURING REVENUE

C. F. Haglin & Sons, Inc., Minneapolis contractors, used Lehigh Early Strength Cement for new factory floors. Only 5 days after placing concrete heavy machinery was set up and in operation for profitable production.

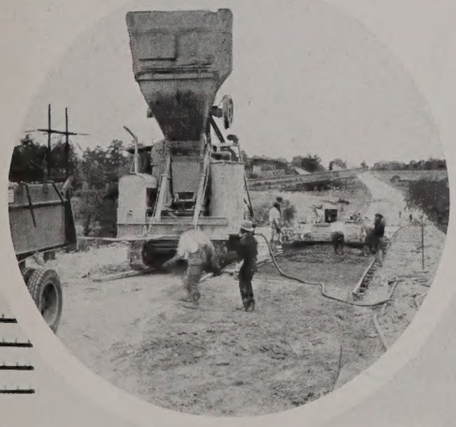
Again when building another unit for Minneapolis-Honeywell Regulator Co., the contractor repeated this profitable use of Lehigh Early Strength Cement for floors. In this case contractor was using new floor 24 hours after placing and the owner in 48 hours.

Earlier profitable use of construction

Again



MINNEAPOLIS-HONEYWELL REGULATOR CO., MINNEAPOLIS, MINN.



26 DAYS SOONER—BONUS EARNED

When J. P. McGuire Construction Co., Petersburg, Va., used Lehigh Early Strength Cement for state highway, completed portions were used for moving equipment after two days' curing. This permitted continuous construction and completion 26 days sooner than with the use of normal portland cement.

Again

Again, the contractor used Lehigh Early Strength for speed. On U. S. Highway No. 1 road widening project traffic was permitted in 48 hours instead of 21 days. Quick completion earned a bonus of $900.

VIRGINIA STATE HIGHWAY, DINWIDDIE COUNTY, VA.

U. S. HIGHWAY NO. 1, PETERSBURG, VA.

THIRTEENTH AVENUE, NEW YORK CITY

For public convenience

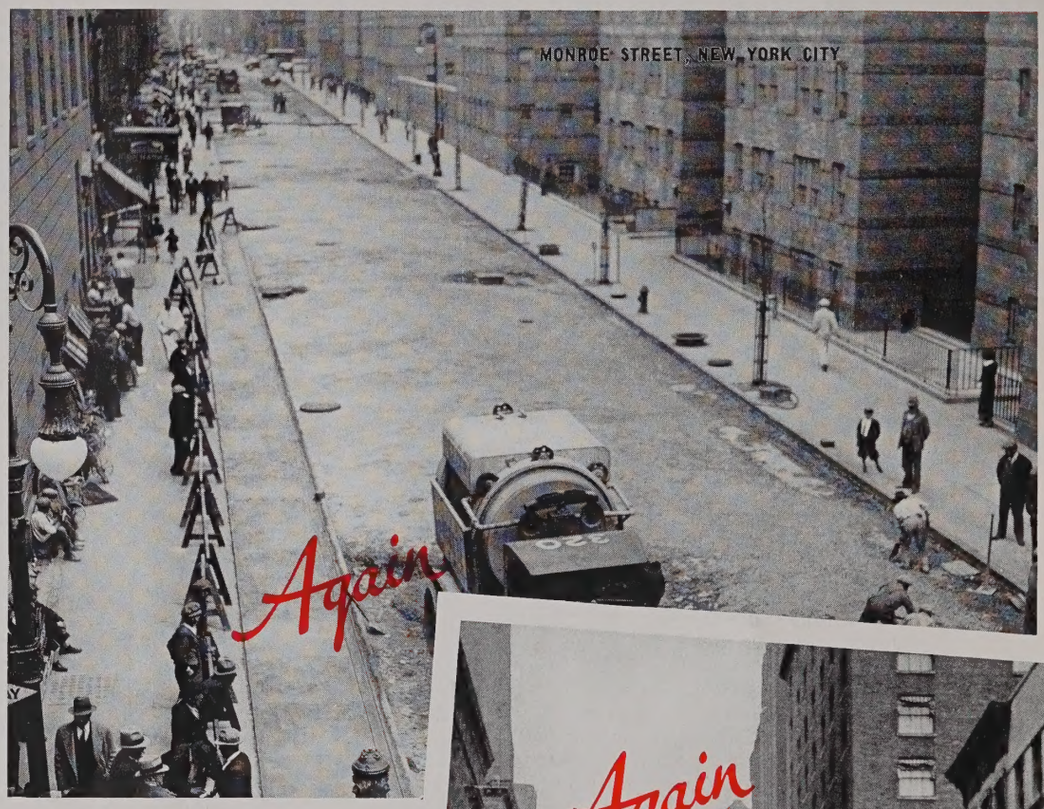
METROPOLITAN TRAFFIC FLOW UNINTERRUPTED

Busy metropolitan streets closed to traffic because of reconstruction cause no end of trouble—public inconvenience, loss to merchants, fire hazard. John Meehan & Son, New York Contractors, first experienced the advantages of Lehigh Early Strength Cement in offsetting these troubles when paving the heavy trucking area on 13th Avenue. 24-hour-old concrete was opened to heavy traffic, thus preventing expensive tie-up of wharf deliveries.

After this experience John Meehan & Son has repeatedly used Lehigh Early Strength Cement. When paving Monroe Street, concrete for base placed one day was opened to traffic next morning at 8 o'clock.

Again Mr. Meehan used Lehigh Early Strength Cement when paving that important traffic artery, Madison Avenue. Traffic permitted on 24-hour-old concrete avoided long closing of any of the street area.

When paving Lexington Ave. from 42nd St. to 53rd St., Mr. Meehan said: "It permitted us to complete contract in 75% of the time allowed. During progress of the work we opened the street to traffic 24 hours after laying the concrete base. This was very helpful to us as well as to the general public, particularly in that section adjacent to Grand Central Terminal, where several hundred thousand pedestrians pass daily."



MONROE STREET, NEW YORK CITY

Again

Again

MADISON AVENUE, NEW YORK CITY

Again

LEXINGTON AVENUE, NEW YORK CITY

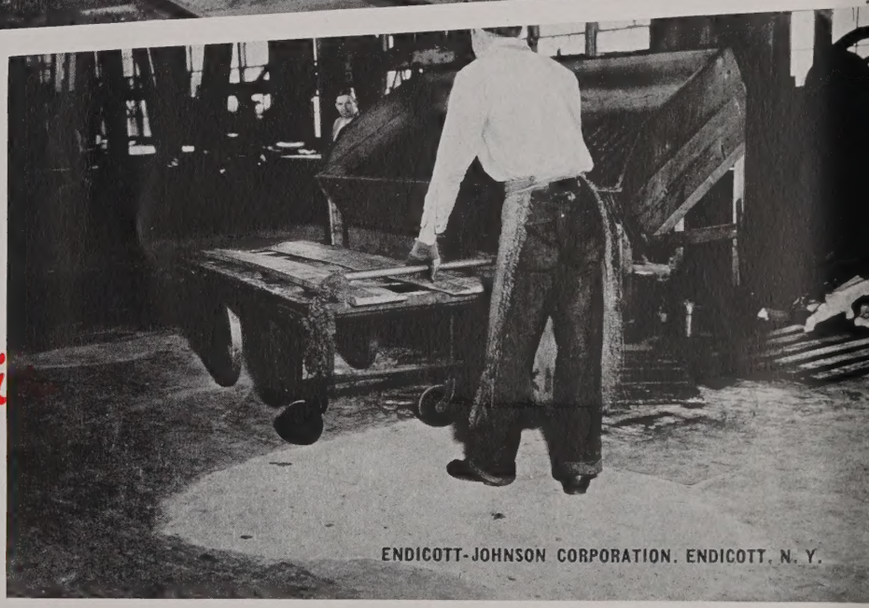
Again

Avoids costly delays

UNINTERRUPTED FACTORY OPERATIONS WITH OVER-NIGHT AND WEEK-END CONCRETE

Endicott-Johnson Corporation, Endicott, N. Y., requires continuous operation in its factories. Heavy trucking breaks down even the finest floors, which necessitates replacement and repairs. New machinery requires new foundations. Increasing demands require new concrete roadways and loading platforms. Protracted time waiting for concrete to cure and harden to service strength would take valuable time out of efficient plant operation. With Lehigh Early Strength Cement Endicott-Johnson obtains concrete that is put into service in from 12 to 72 hours. This avoids long uninterrupted factory operations and provides good reason why they use it repeatedly for new construction and repairs.

Again



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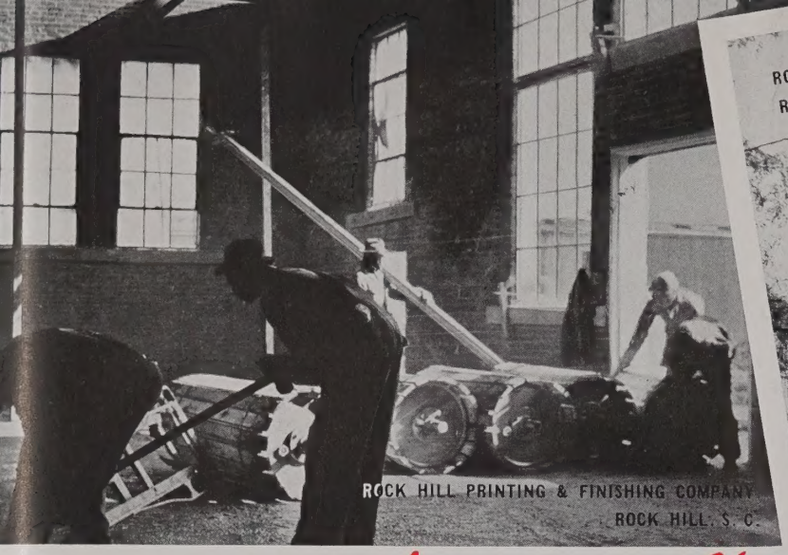


ROCK HILL PRINTING & FINISHING COMPANY.
ROCK HILL, S. C.

ROCK HILL PRINTING & FINISHING COMPANY.
ROCK HILL, S. C.

Again

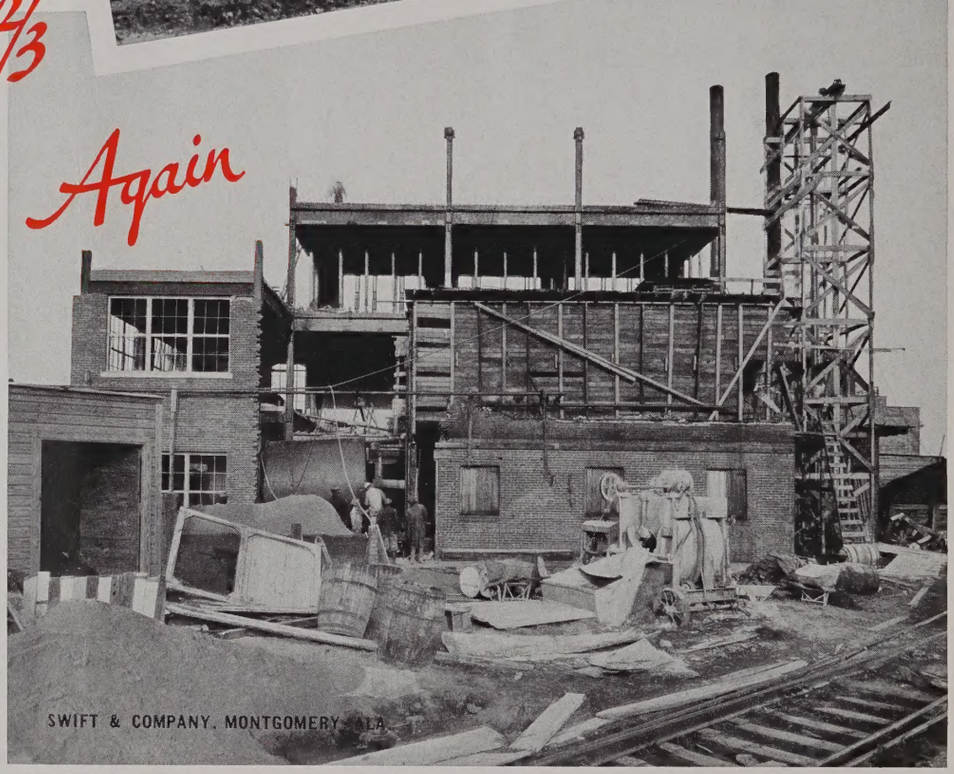
Form costs reduced ½ to ⅔

SPEED AND LOWER COSTS FOR INDUSTRIAL BUILDINGS

Productive use of new building and coal trestles was wanted by Rock Hill Printing and Finishing Co. with all possible haste. Fiske-Carter Construction Co., Spartanburg, S. C., used Lehigh Early Strength Cement and the job was completed in one-half contract time—owner secured use of building in 80 days instead of 160. Contractor earned a bonus—reduced overhead expense on job by 80 days saved—quick re-use of forms saved on form lumber costs—45,000 less board feet were used than would have been necessary with normal cement.

Again Fiske-Carter Co. used Lehigh Early Strength Cement when bad weather slowed up the building schedule on Swift & Co. building. Quick service concrete made up all lost time and actually helped complete the job 3 weeks in advance of time limit.

30,000 feet of lumber for forms instead of 90,000 saved $1200 for Fiske-Carter Co. when building the warehouse for Sonoco Products Co. Because they used Lehigh Early Strength Cement, only 48 hours after pouring concrete forms were stripped from columns, slabs and beams —with normal cement 7 to 29 days would have elapsed.

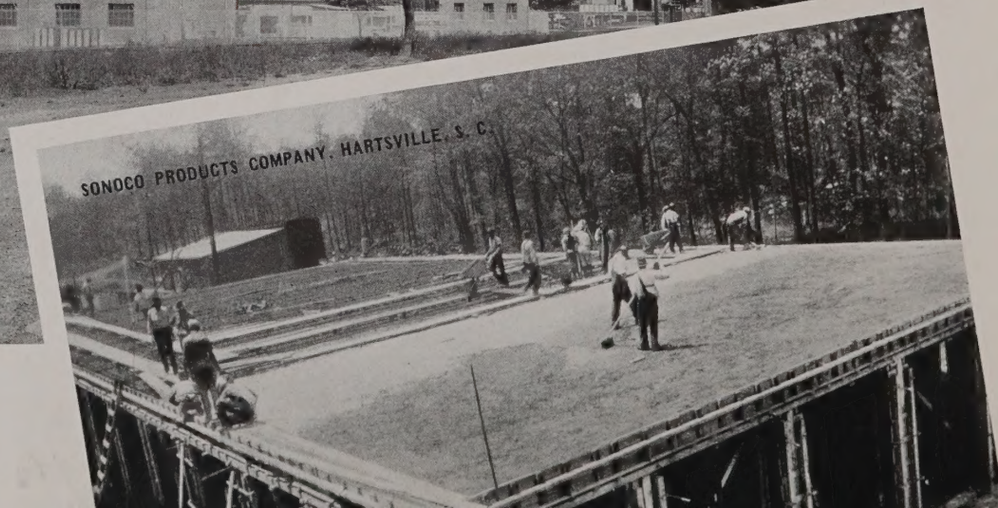


Again

SWIFT & COMPANY, MONTGOMERY, ALA.

SONOCO PRODUCTS COMPANY, HARTSVILLE, S. C.

Again



SONOCO PRODUCTS COMPANY, HARTSVILLE, S. C.

FABER STREET. MARINERS HARBOR. N. Y. STATEN ISLAND RAPID TRANSIT CO.

Coordinates construction schedule

MAPLE AVE.. MARINERS HARBOR. N. Y. STATEN ISLAND RAPID TRANSIT CO.

EXPENSIVE DELAY AVOIDED

P. T. Cox Contracting Co. of New York used Lehigh Early Strength Cement to get quick service concrete which would permit continuous construction on grade crossing elimination for Staten Island Rapid Transit Co. Even in cold weather, forms were stripped in 24 hours. Costly delays were avoided because after 7 days concrete was permitted to bear weight of locomotive crane used for setting pre-cast slabs, each weighing 22 tons.

Again when speed of completion was necessary because of scheduled opening of Triborough Bridge, P. T. Cox Contracting Co. used Lehigh Early Strength Cement on their section of the roadway paving work.

Again

TRIBOROUGH BRIDGE. NEW YORK CITY

Insures on-time completion

TRIBOROUGH BRIDGE NEAR QUEENS APPROACH

Reference tables for cold weather concrete are on the back cover.

MIXING AND PLACING CONCRETE AT LOW TEMPERATURES

RECOMMENDED PRACTICE WITH LEHIGH EARLY STRENGTH CEMENT

Procedure recommended is based upon the following: 1. Minimum water content to provide necessary workability and desired strength. 2. Minimum heat loss after mixing. 3. Moist curing.		Heavy sections such as foundations, piers, retaining walls, dams and other mass construction.	Roads, streets, sidewalks and other surface construction.	Thin sections such as beams, columns and other exposed work.
		With Lehigh Early Strength Cement. A.S.T.M. Specification C74-36.	With Lehigh Early Strength Cement. A.S.T.M. Specification C74-36.	With Lehigh Early Strength Cement. A.S.T.M. Specification C74-36.
For Cool Weather When Temperatures Do Not Fall Below 40° F.	Protection of Materials	Aggregates free of frost. Heated aggregates not necessary. Heated water will accelerate curing.	Aggregates free of frost. Heat water — not above 180°-190° F.	Aggregates free of frost. Heat water — not above 180°-190° F.
	Temp. of Concrete when placed	60° F.	70° F.	60° F.
	Curing period	12 to 24 hours	12 to 24 hours	12 to 24 hours
	Protection during curing period	Under canvas or straw to retain heat.	Under canvas or straw to retain heat.	Use canvas tarpaulins and straw covering to retain heat.
	Service strength at	24 hours	Light duty in 36 hours. Heavy duty in 72 hours.	48 hours
For Cold Weather When Temperatures Range Between 40° F. and 20° F. Minimum	Protection of Materials	Heat all water and aggregates — water not above 180°-190° F. Remove all snow and ice from forms.	Heat all water and aggregates. Water not above 180°-190° F. Deposit concrete on subgrade free of frost.	Heat all water and aggregates. Water not above 180°-190° F. Deposit concrete in forms free of ice and snow. Warm forms with steam if available.
	Temp. of Concrete when placed	70° F.	80° F.	80° F.
	Curing period	18 to 48 hours	24 to 48 hours	24 to 48 hours
	Protection during curing period	Provide heat if possible — cover all exposed surfaces with straw and canvas.	Cover with straw and canvas to prevent early heat loss.	Enclose forms with tarpaulins and heat with steam or salamanders.
	Service strength at	48 hours	Light duty in 72 hours. Heavy duty 5 to 7 days.	72 hours
For Cold Weather When Temperatures Fall Below 20° F.	Protection of Materials	Heat all water and aggregates — water not above 180°-190° F. Remove all snow and ice from forms.	Heat all water and aggregates. Water not above 180°-190° F. Deposit concrete on subgrade free of frost.	Heat all water and aggregates. Water not above 180°-190° F. Deposit concrete in forms free of ice and snow. Warm forms with steam if available.
	Temp. of Concrete when placed	70° F.	90° F.	80° F.
	Curing period	24 to 72 hours	48 to 72 hours	48 to 72 hours
	Protection during curing period	Provide heat wherever possible — cover all exposed surfaces with straw and canvas.	Cover with heavy straw layer and canvas to prevent early heat loss.	Enclose forms with tarpaulins and heat with steam or salamanders.
	Service strength at	72 hours	Light duty in 72 hours. Heavy duty 5 to 7 days.	72 hours

Note:—The range of curing period suggested is intended to cover concretes of various water ratios. Water contents around 5 gallons per sack will require but ⅓ to ½ the curing period necessary for concretes using 8 to 9 gallons per sack.

COMPARATIVE STRENGTH VALUES

Concrete made with various water ratios exposed to low temperature range

	Compressive Strength in lbs. per sq. in. at	Exposed to 50°F. After 70°F. Curing		Exposed to 33°F. After 70°F. Curing		Exposed to 16°F. After 70°F. Curing	
		Standard Portland Cement Cured 3 days	High Early Strength Cement Cured 1 day	Standard Portland Cement Cured 3 days	High Early Strength Cement Cured 1 day	Standard Portland Cement Cured 3 days	High Early Strength Cement Cured 1 day
4½ Gals. Per Sack	1 day		2660		2660		2660
	3 days	3710	4200	3710	3560	3710	3400
	7 days	4400	5130	4160	4910	4030	3470
	28 days	5890	6850	5180	6310	4340	3870
6 Gals. Per Sack	1 day		1670		1670		1670
	3 days	2430	3380	2430	2420	2430	2140
	7 days	3070	4440	2710	3470	2480	2380
	28 days	4090	5240	3710	4990	2740	2440
9 Gals. Per Sack	1 day		780		780		780
	3 days	1060	1680	1060	1300	1060	1100
	7 days	1460	2320	1240	1810	1120	1160
	28 days	1920	3320	1680	2680	1130	1270

From "Temperature Effects on the Strength of Concrete,"—Timms & Withey—A.C.I. Proceedings, Vol. 30, 1934

DETERMINING SERVICE STRENGTH AT LOW TEMPERATURES

"For concrete exposed to temperatures below freezing, the strength at any time after the period of initial curing depends primarily on the strength developed during the initial curing period." This quotation is from the conclusions drawn by A. G. Timms and N. H. Withey after an extensive series of tests conducted by them to determine temperature effects on compressive strength of concrete with particular reference to such conditions as prevail when concreting in cold weather. (Journal of the American Concrete Institute, Vol. 5, No. 3.)

The table, "Comparative Strength Values," in the opposite column is made up from figures taken from these data and make a direct comparison of concrete strengths developed by standard Portland Cement cured 3 days at 70° before exposure and High Early Strength Cement cured 1 day at 70° before exposure.

Early Service Strengths

Note particularly the definite strength advantage of the High Early Strength cements when subjected to 50° F. and 33° F. temperatures notwithstanding the 48-hour reduction in heat curing. The concrete used in the tests was made with various mixing water contents from 4½ to 9 gal. per sack of cement.

With the manifest advantages which result in expensive curing time saved when Lehigh Early Strength Portland Cement is used, it is well to consider, when designing any concrete mixture for placing in cold weather, the facts that the strength of concrete at any age decreases as the amount of mixing water increases; and that the rate of hardening of any concrete mixture slows up as the temperature of the concrete lowers.

Low Water Ratio Advisable

This table demonstrates very clearly the advisability of holding the water content down. Nine gallons of water per sack of cement is seldom necessary on average work; it makes very wet concrete, and always definitely reduces the early strength of all concretes regardless of temperatures or exposure. During cold weather such high water contents can greatly retard job progress. Note that 3 added gallons of water reduces the compressive strength of all concretes by approximately 50% (6 to 9 gallons).

Below 20° F.

The strength values for concrete exposed to 16° F. after curing for 24 hours at 70° F. are particularly significant. It will be noted that safe service strengths are attained for concrete made with high early strength portland cement except when the water content is high. When as much water as nine gallons per sack of cement is used, it is manifest that more than 24 hours' curing should elapse before removal of forms when exposed to temperatures below 20° F. Reference to the tables in the opposite column will indicate that curing periods of 48 hours are recommended except for heavy mass sections.

SUGGESTIONS FOR COLD WEATHER CONCRETE WORK

Heating Materials

Mixing water and aggregates should be heated, whenever necessary, to insure the concrete leaving the mixer at 60° or better. Aggregates not less than 40° and water about 180° will accomplish this. Aggregates in frozen lumps should be thawed independently—no materials containing frozen lumps should be permitted to enter the mixer. Water is easily heated by running a steam pipe into the water barrel, or by piping the water through a coil mounted over a fire on the ground.

Aggregates are best heated by 1½" steam pipes laid as a grill under the piles or by a 6 ft. length of perforated pipe inserted into the pile. A fire built inside of a large pipe (or section of metal culvert) will heat aggregates quickly for small jobs. Pile the cold aggregates against it; sand on one side and stone on the other.

Mixing and Transporting

Thorough mixing is necessary and permits the use of the minimum water content to obtain the desired strength concrete. The mixing should be done as close to the point of placing as possible. When placed the concrete should have a temperature of from 60° F. to 90° F., depending upon the air temperature and nature of the job (see upper table in opposite column). When water and aggregates are very hot, it is advisable to mix these together first before adding the cement.

Placing

Forms should be entirely free from ice and snow. A steam jet or blow torch may be used for this purpose. It is helpful to warm the forms and any steel reinforcing by means of live steam if it is available Placing should be accomplished as rapidly as possible since the heat loss is greatest at this time. Immediately after placing, protection should be provided as demanded by the air temperatures and job condition (see upper table in opposite column).

Protection

Salamanders, tarpaulins, etc., should be available to maintain the proper moist curing temperature for the length of time required.

The extra effort necessary to maintain adequate heat protection will materially assist in the hardening of the concrete. Provision should be made for the maintenance of the proper curing temperature against the contingency of sudden temperature drops.

Too rapid drying out of the concrete should be avoided under all conditions, as is usual in concrete curing at normal temperatures.

Frozen Concrete

Alternate freezing and thawing of the concrete before it has reached the safety point must be avoided. If fo any reason there is a possibility that the concrete has frozen, tests should be made before forms are entirely removed. To make such a test, steam, hot water or the flame from a blow torch should be applied to the concrete. If the concrete has been frozen, upon the application of such heat it will soften at once, due to the melting of the ice. If the concrete has not been frozen, the application of heat will not affect the surface.

Temperature Records

Under some job conditions it may be desired to keep detailed dated and timed temperature records at regular intervals of the air temperature; temperature of concrete when mixed, and as deposited; temperature under the protection provided or within the enclosure. Such records would show the favorable or unfavorable conditions to which the concrete had been subjected and be of assistance in determining how soon forms could be removed or service obtained.

CONSIDER POSSIBLE SAVINGS WITH LEHIGH EARLY STRENGTH PORTLAND CEMENT

When considering any winter construction, it will be worthwhile to work up two job schedules—one contemplating the use of standard Portland Cement and the other Lehigh Early Strength Portland Cement. A comparison of all cost figures will determine the economy of Lehigh Early Strength Portland Cement for the specific case. The following items are important:

1. The per day savings from the curtailed use of heating plant for eggregate and water.
2. The reduced cost of lumber because of fewer forms required.
3. One-half to one-third normal cost of heat curing considering
   - Less housing or tarpaulin protection
   - Fewer salamanders and less fuel
4. Reduced expense because of earlier job completion increased job efficiency; reduced overhead; reduced interest charges; earlier revenue from completion.

Building owners, bankers, and investors should be aware of the benefits which accrue from a broad point of view of eliminating the seasonal peaks in construction.

1. Steady employment of capital in building.
2. Year round employment of manufacturing facilities contributing to the construction industry.
3. A more even flow of heavy freight.
4. Reduced carrying charges and loss of rental from delayed construction when building has been definitely decided upon.
5. The ability to plan and execute alterations and repairs at a time most advantageous to the owner.

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